

MATH 572 Projectwork 1 - Due Tuesday, February 19

Write a program which can solve the BVP

$$a(x)u''(x) + b(x)u'(x) + c(x)u(x) = f(x), 0 < x < L$$

with $u(0) = \alpha$ and $u(L) = \beta$, using a 2nd-order finite difference method on a uniform mesh.

Details:

1. The user should be able to modify the code or vary inputs for various $a, b, c, f, L, \alpha, \beta$ and h .
2. In cases when the solution is known, the global error should be computed using the 2 and ∞ norms.
3. You can use an existing program or a builtin routine to solve the resulting linear system.
4. The code should be your own and should be well-commented. It should contain a description of the problem, the finite difference method approximation and instructions on how to use/modify for different problems.

Testing: I'll provide a series of problems that you'll need to solve using your program. One of the key things to test will be whether or not the computed error over a range of values of h matches the expected performance.

To Turn In: Turn in a hard copy of your code and a summary of all the tests.

Extras: (not required)

1. Include options for using Neumann boundary conditions at one end or the other.
2. Modify to allow for non-uniform mesh
3. Write your own matrix solver (efficiency counts)